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ES-50 Battery Bank
50 kWh Battery Bank for GridOptimizer™

ES 50 Battery Bank

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Energy storage has a myriad of potential uses, from peak shaving to renewable integration. Having a dependable and scalable building block is crucial to developing different sized advanced energy storage systems. The EnerBlü Advanced Energy Storage module is a 50kWHr battery that can be easily controlled and stacked; allowing for systems that range from a couple kWHr to MWHr systems.

Turnkey energy storage bank for GridOptimizer and other uses

- 50 kWh building block
- High Energy Density
- Robust and Reliable Energy Storage
- Low Heat
- Long Life

Energy Storage Pack Specifications

Specification	Min	Nom	Max	Units
Battery Pack Capacity	50			kWh
Pack Voltage	448	528	584	V
Pack Current	-110		110	A
Pack Capacity	110			Ah
Cells		128		cells
Self-Discharge Rate			3%	/month

Storage Cell Specifications

Specification	Min	Nom	Max	Units
Voltage(per Cell)	2.8	3.3	3.6*	VDC
Capacity		110		Ah
Operating Temperature	-20		55	C
Lifetime	4000			Cycles
Self-Discharge Rate			3%	/Month
Chemistry	Advanced Lithium Ion			

*Under typical operating conditions, see Figure 2a and 2b: Discharge/Charge Profiles
**Depends on DoD, see Figure 1: Minimum Lifetime vs. Depth of Discharge

Cell Management Specifications

Specification	Min	Nom	Max	Units
Supply Voltage	10		16	VDC
Supply Current		250		mA
Operating Temperature	-40		80	°C
Cell Balancing Current			200	mA
Cell Balancing Resolution		10		mV
Cell Sensing Resolution		1.5	3%	mV
Communication	Controller Area Network (CAN)			

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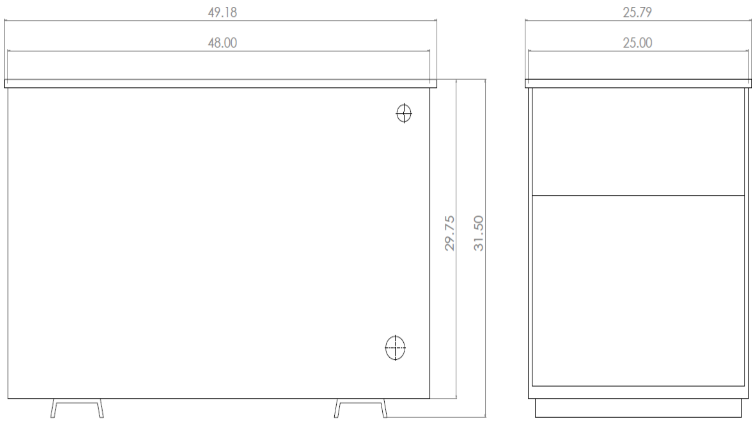
Dimensions (in inches)



Depth of Discharge vs.Lifetime

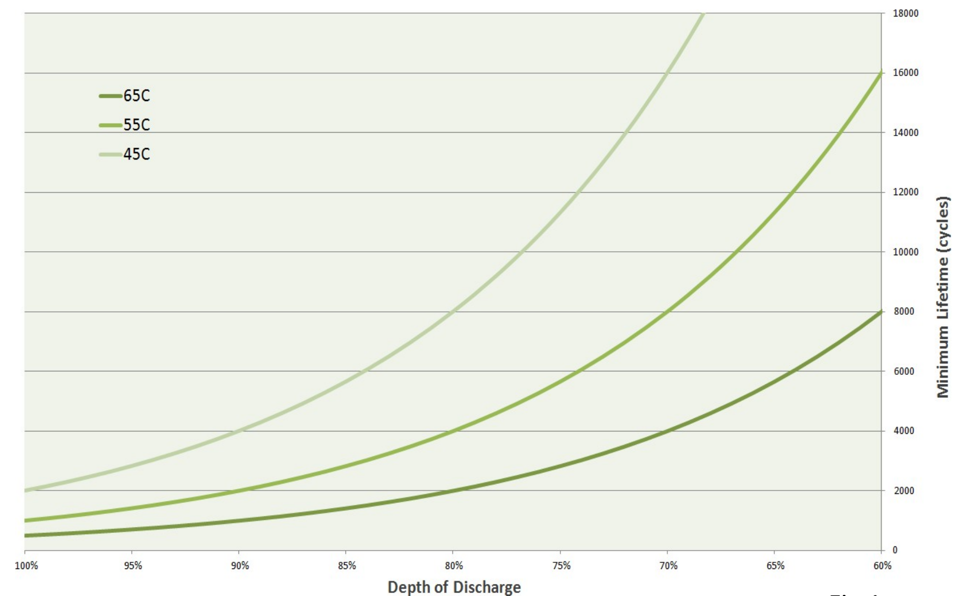


Fig.1

Environmental Specifications

Specification	Min	Nom	Max	Units
Temperature	0		50	VDC
Rated Max. Elevation			6,000	FT
Enclosure Rating		Type 3R		

Control and Safety

Specification	
Monitors	Cell Voltages Current Pack Voltage Temperature State of Charge (SoC) State of Health Depth of Discharge
Safety Features	Storage Overvoltage Storage Undervoltage Storage Overcurrent Overtemperature Overcharge Undercharge BMS Fault
Communication	Controller Area Network (CAN)

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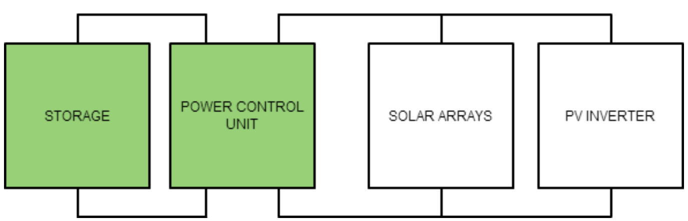
GridOptimizer™

Demand Response Application Example

The Grid Optimizer operates as an add-on to a system which includes an inverter and photovoltaic (PV) solar panels. The diagram below shows the Grid Optimizer tied to the inverter and PV. The power control unit of the GridOptimizer is connected to the PV and the inverter. The PV generates DC power and supplies power to the inverter and the power control unit of the GridOptimizer.

Energy storage can be coupled with an existing photovoltaic (PV) system to greatly reduce power costs. While PV production is based solely on the weather, energy storage power can be controlled. Using energy storage to save energy during the sunny hours and deliver that same energy during peak cost hours can reduce electricity bills substantially. The system would monitors the user's load, and if it begins to go above a certain peak threshold the energy storage would activate, serving some of the load, and reducing this peak, which in turn would result in lower peak demand charges.



Utility Application Example

The increasing integration of distributed renewable energy has increased stress on the power grid. By their very nature, photovoltaic (PV) energy fluctuates dramatically with weather. This fluctuating power output from these renewable sources can cause line regulators, tap changers, and switched capacitors to switch much faster than before. PV and inverter instabilities can also contribute to transients, harmonics, and instability in the distribution system. For example, if a PV string was generating 100 kW and a cloud passed over the array, this power could drop to under 50kW in less than 30 seconds. This can be very disruptive to the stability of the grid. Adding energy storage to an existing PV system is one way to reduce these harmful effects. As can be seen above in figure 1, the Pacific Energy system can be added on to existing systems. The energy storage can buffer the output of the PV, reducing weather anomalies. The energy storage can also be used to level peaks in demand, create custom daily power outputs, and optimize the time at which the solar energy is sold for maximum profit.

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